Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2018

Subject Code:2140907 Date:22/11/2018

Subject Name:Applied Thermal and Hydraulic Engineering

Time: 02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of steam tables is permitted.**

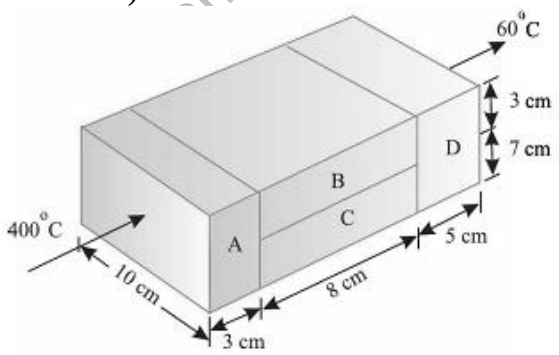
			MARKS
Q.1	**(a)**	Name and explain briefly the various modes of Heat Transfer.	**03**
	(b)	Enlist various devices used to measure pressure of the fluid. With neat sketch explain working and construction of Bourdon tube pressure gauge.	**04**
	(c)	With neat sketch explain Rankine cycle for thermal power plant. Plot the same cycle on T-s and h-s diagram also.	**07**
Q.2	**(a)**	Enlist the different methods of improving efficiency of Brayton cycle and explain any one in detail.	**03**
	(b)	What is Draft Tube? Why it is used in Reaction Turbine?	**04**
	(c)	Find the heat flow rate through the composite wall as shown in figure. (assume one dimensional flow)	**07**

k_A= 150 W/m°C

k_B = 30 W/m°C

k_C= 65 W/m°C

k_D= 50 W/m°C



OR

	(c)	A steam Pipe of outer diameter 120 mm is covered with two layers of lagging, inside layer 45 mm thick (k = 0.08 W/m°C) and outside layer 30 mm thick (k = 0.12 W/m°C). The pipe conveys steam at temperature 262.4 °C. The outside temperature of lagging is 25°C. if the steam pipe length is 30 m long, determine (i) Heat loss per hour (ii) Interface temperature of lagging. The thermal resistance of steam pipe can be neglected.	**07**
Q.3	**(a)**	Explain Fins and their application.	**03**
	(b)	With neat sketch, explain working of venturimeter for flow measurement.	**04**

	(c)	What are the factors decide whether Kaplan, Francis or Pelton type turbine would be used in a hydroelectric project?	**07**
		OR	
Q.3	**(a)**	Define Heat, Heat Transfer and Thermodynamics.	**03**
	(b)	Define the Specific Speed of Turbine and derive an expression for the same.	**04**
	(c)	A steam power plant working on Rankine Cycle has range of operation from 40 bar dry saturated to 0.05 bar. Determine: (i) Cycle efficiency (ii) Work ratio (iii) Specific Steam Consumption.	**07**
Q.4	**(a)**	What is Cavitation?	**03**
	(b)	What is the Concept of Black Body? Define Emissivity& Kirchhoff's Law for radiation.	**04**
	(c)	In a constant pressure open cycle gas turbine air enters the compressor at 1 bar and 18ºC where it is compressed to a pressure ratio of 6. The gases enters the gas turbine at 730 ºC and expands to original pressure. Calculate the work ratio and the thermal efficiency when a gas turbine plant operates on a Brayton cycle. Assume, $\gamma = 1.4$, Cp = 1.0 kJ/kg K for air and $\gamma = 1.3$, Cp = 1.1 kJ/kg K for gases. Neglect the mass of fuel.	**07**
		OR	
Q.4	**(a)**	Draw inlet and outlet Velocity triangles for any Reaction turbine. Indicates various velocities with its direction.	**03**
	(b)	Calculate the critical radius of insulation for asbestos (k = 0.172 W/mK) surrounding a pipe and exposed to room air at 3300 K with h = 2.8 W/m^{2}K. Calculate the heat loss from a 475 K, 60 mm diameter pipe covered with the critical radius of insulation and without insulation.	**04**
	(c)	Explain the working of a simple air cooling system used for aircraft.	**07**
Q.5	**(a)**	Explain Multistage Centrifugal Pumps.	**03**
	(b)	Give comparison between open cycle and closed cycle gas turbines	**04**
	(c)	Derive expression for LMTD for Counter flow heat Exchanger.	**07**
		OR	
Q.5	**(a)**	State and prove Bernoulli's equation.	**03**
	(b)	Explain simple vapour compression refrigeration system with neat sketch.	**04**
	(c)	The flow rates of hot and cold water streams running through a parallel flow heat exchanger are 0.2 kg/s and 0.5 kg/s respectively. The inlet temperatures on the hot and cold side are 75°C and 20°C. the exit temperature of hot water is 45°C. If the individual heat transfer coefficient on both sides are 650 W/m^2°C, calculate the area of the heat exchanger.	**07**

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